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ABSTRACT

Log-linear modeling was employed to explore the conceptual relationships among community college student persistence and nine variables, including student demographics, purpose for enrolling, intentions to return, frequency of informal interaction with faculty, and satisfaction with the institution in general. The study sample was 369 new and continuing students enrolled at a surburban community college during fall 1984. Four hierarchical models that are posited indicate significant interactions between persistence and intentions to return and persistence and sex (i.e., full-time female students had greater persistence than their male counterparts). Measures of academic integration, such as grade-point average, number of hours spent studying each week, and frequency of interaction with faculty, had independent effects. Review of conceptual models of persistence focusing on four-year colleges and universities suggests that academic integration may be of less importance in explaining persistence at community colleges than at four-year institutions. The application of log-linear modeling to higher education research, and specifically persistence studies, is discussed. (SW)

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Toward Building Models of Community College Persistence: A Log-Linear Analysis

Presented at
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of the Association for Institutional Research

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Ann K. Dickey, Chair
Forum Publications Editorial
Advisory Committee

Abstract

Log-linear modeling was employed to explore the conceptual relationships among community college student persistence and nine variables, including student demographics, purpose for enrolling, intentions to return, frequency of informal interaction with faculty, and satisfaction with the institution in general. Four hierarchical models posited in this study indicate significant interactions between persistence and sex and persistence and intentions to return. Measures of academic integration, such as grade-point average, number of hours spent studying each week, and frequency of informal interaction with faculty had independent effects. A synopsis of the connections between the findings reported here and conceptual models of persistence focusing on four-year colleges and universities is presented and the application of log-linear modeling to research problems in higher education, in particular, to studies of persistence, is examined.

Introduction

Studies of student persistence conducted at community colleges are overwhelmingly descriptive in nature. No conceptual models of student persistence behavior have been advanced to explain the complex interaction of unique influences and students found at the community college. In contrast, studies of student persistence within four-year colleges and universities are guided almost without exception by one or more theoretical underpinnings (Bean, 1980, 1983; Haller & Portes, 1973; Rootman, 1972; Spady, 1970; Tinto, 1975). Research generated by these conceptual models is generally focused on students aged 18 to 24 who are enrolled full-time at baccalaureate-granting institutions that are typically residential in nature. For these reasons, this research has limited application to the community college. In view of the fact that community colleges now enroll fifty-five percent of the nation's first-time freshmen (Mahoney, 1986), the lack of connection between conceptual studies of persistence and the community college environment represents a substantial gap in the literature.

Community college students as a whole are older, are much more likely to attend college part-time, and, because of the nonresidential nature of most community colleges, are commuters. Community college students also attend classes for a wide variety of reasons other than obtaining a degree, including self-improvement, career advancement, vocational certification, and earning credit to transfer to a 4-year college or university.

This study investigates the influence of demographic variables shown to be significantly associated with the persistence of community college students and conceptual variables borrowed from extant persistence models, such as the number of informal interactions with

faculty and satisfaction with the college in general, on community college student persistence.

Literature Review

No study of student persistence is complete without mention of the most frequently cited model of student persistence posed by Tinto (1975). Tinto's model specifies a reciprocal relationship between academic integration and social integration; a low level of academic integration may be compensated for by a corresponding high level of social integration and vice-versa. For the purposes of this paper, it is important to note that the first suggested improvements to the Tinto model arose from a study of commuter students (Pascarella, Duby, & Iverson, 1983). Pascarella et al. (1983) found that student background characteristics had direct effects on persistence which were unmediated by the extent of either academic or social integration. The effects of student background characteristics and other variables associated with persistence at community colleges or commuter institutions follow.

Ethnicity

Several reports (Lenning, Beal & Sauer, 1980; Voorhees, 1985) suggest that there is no significant difference in attrition rates between minority students and whites other factors, such as academic ability and socioeconomic status, are controlled. Peng and Fetters (1978) found no significant difference between attrition rates of black and white students at 2-year colleges. The National Center for Education Statistics (1980) reported that Hispanic students demonstrate significantly higher dropout rates than non-Hispanics.

Part-time vs. Full-time Enrollment Status

Students who enroll on a part-time compared to a full-time basis in community colleges are more likely to drop out or stop out (Walleri,

1981). In general, part-time community college students are likely to be older than full-time students and, therefore, are more likely to be occupied with commitments outside of the college environment such as marriage, family, and jobs that preclude opportunities to participate in either social or academic experiences that may be available at the community college.

Sex

There is little empirical evidence that males and females differ significantly in their persistence patterns. However, gender has been found to interact significantly with other predictor variables (see, for example, Bean, 1980) and, for this reason, sex was selected as a cross-classification variable in this study.

Academic Integration Variables

Academic variables are prominent in models of traditional student persistence and are frequently used as indicators of academic integration. The effect of academic performance on persistence may be related to institutional policy; failure to achieve minimum levels of performance can result in dismissal. Above minimum levels, GPA may be perceived as a reward for the academic experience. The higher the level of reinforcement, the more likely a student will remain in school. Positive associations between cumulative grade-point average and persistence at commuter institutions have been reported several times in the literature (Peng & Fetters, 1978; Voorhees, 1985).

Frequency of contact with faculty outside the classroom appears to be one of the most important forms of academic integration to influence student persistence (Pascarella and Terenzini, 1977). Frequent contact with faculty outside the classroom also has been shown to be instrumental in student intellectual and social development (Endo & Harpel,

1982). In this study, self-reported grade point average, number of hours spent studying each week, and the frequency of informal interaction with faculty outside of class were posed as key measures of academic integration.

Student Intentions

For many younger students the community college may be viewed as the first stop enroute to a baccalaureate degree. Several researchers (Tinto, 1975; Lenning et al., 1980) suggest that student transfer is a major reason for students' subsequent attrition from the community college. Bean and Metzner (1985) indicate that the probability for transfer is greater among younger students enrolled at commuter institutions because they are unencumbered by careers and family commitments typical of older, part-time students. It is also logical to expect that the reasons students enroll at community colleges are likely to be more heterogeneous than the intentions of students enrolling at four-year institutions or universities. A part-time student attending a community college, for example, might enroll in an accounting course for job advancement or in a literature course for personal interest; once this short-term goal is reached, the student is not likely to return unless other goals emerge. The effect of utilitarian goals on the persistence of part-time community college students is illustrated by Knoell (1976) who reported that a disproportionate percentage of part-time students entering a community college for employment-related reasons persisted at a significantly greater rate that part-time students who enter for other reasons.

Satisfaction

Satisfaction with the role of being a student has been shown to be positively related to university student persistence (Bean, 1980).

According to Lenning and Hanson (1977), older students expressed greater satisfaction with their courses than their younger counterparts. The role of general satisfaction with the institution is less clear, but if satisfaction with single components of an institution is a significant factor in determining persistence, then an aggregate measure of satisfaction should also be linked to persistence.

Intent to Leave

Students' intent to leave the college at the end of a current term or academic year is a potent predictor of actual attrition (Bean, 1983; Pascarella, et al. 1983).

As this brief review indicates, few persistence studies focus exclusively on the community college; fewer still attempt to explain the conceptual connections between empirical findings and the persistence of community college students. Against this background, the present study applies constructs borrowed from extant conceptual models to the persistence behavior of a sample of community college students. It is noted that the concepts explored here were not developed specifically from the study of community college persistence patterns. However, the relevancy of such key concepts as social and academic integration (Tinto, 1975), intent to return (Bean, 1983), and general institutional satisfaction has not been demonstrated on the community college level.

Method

The subjects of this study were 369 new and continuing students enrolled at a surburban community college enrolling about 5,700 students in the Fall of 1984. Subjects were registered in one of the 56 random classes selected to be administered the American College Testing program's Student Opinion Survey (2-Year College Form), a standardized

instrument designed to provide profiles of student attitudes and opinions. Comparison of the demographic characteristics of all students enrolled at the college to the sample showed that females were slightly underrepresented in the sample and that the sample was somewhat younger. The subjects were representative of the student body with respect to ethnicity. Subjects also were asked to answer twenty-six locally developed research questions probing concepts that the literature had shown to be important in explaining persistence behavior.

Persistence

In order to capture enrollment patterns typical to community colleges in which students may not return for the following term but may return in subsequent terms (see, for example, Walleri, 1981; Winter & Fadale, 1986), persistence was conceptualized as re-entry in either the following spring or fall semesters. Students were assigned persistence categories after attempting to match individual Social Security Numbers against student master files for either of these terms. Two hundred forty-three (63.4%) of the subjects who re-entered during this time span were coded "1." One hundred thirty-five subjects (36.6%) who did not return during either term were classified "nonpersisters" and were coded "0." Because this study did not control for academic dismissal, it was not possible to differentiate between nonpersisters who were voluntary leavers and nonpersisters who were dismissed for academic reasons.

Study Variables

There are many variables which could be included in a persistence study of community college students. However, a goal of this study was to trace the conceptual connections between models developed for other settings, that is, four-year colleges and universities, and the extant research pertaining to community college and commuter student

persistence. This goal served as a guide to select the variables under investigation (Table 1).

Statistical Techniques

The level of measurement obtained from the survey and subsequent measures of persistence was categorical, or qualitative, in nature. Because the data were non-interval and their expected distributions were non-normal, log-linear analysis was selected as the general technique for analysis.

Log-linear models are conceptually similar to Analysis of Variance techniques and multiple regression models. These techniques, however, are parametric in nature and rely on interval or ratio level data to be properly employed. In log-linear models, all variables that are used for classification are independent variables, and the dependent variable is the number of cases in a given cell of the crosstabulation. Complex designs, such as those using variables with K levels, generate multiway tables in which the number of cases in individual cells may be expressed as a function of the independent variables under investigation.

Hinkle and McLaughlin (1984) identify two distinct types of log-linear models, association models and logit models. The purpose of association models is to determine the independence among variables. Kennedy (1983) defines association models as symmetrical, meaning that no designation between an independent (or explanatory) variables and dependent (or response) variables is posed. The exploratory nature of this research dictated that symmetrical, or association, modeling be employed.

Unlike multiple regression techniques applied in path analytic modeling, associational log-linear modeling does not provide estimates of

Table 1

Frequency Distributions of the Variables

1. Ethnicity (ETHN)

   a. Afro-American/Black [0.3]
   b. American Indian/Alaskan Native [0.6]
   c. Caucasian American/White [88.2]
   d. Mexican American/Chicano/Hispanic [2.2]
   e. Asian American, Oriental or Pacific Islander [1.7]
   f. Other or Prefer Not to Respond [7.1]

2. Registration Status at Entry (FTPT) [a]

   a. Full-Time [61.7]
   b. Part-time [38.3]

3. Sex (SEX)

   a. Male [44.5]
   b. Female [55.5]

4. Purpose for Enrolling (PURPOSE)

   a. No Definite Purpose in Mind [0.8]
   b. To Take a Few Courses for Self-Improvement [5.5]
   c. To Take a Few Job-Related Courses [5.5]
   d. To Take Courses Necessary for Transfer to Another 2-Year College [4.2]
   e. To Take Courses Necessary for Transferring to a 4-Year College or University [36.0]
   f. To Complete a Vocational/Technical Program [5.3]
   g. To Obtain or Maintain Certification [8.6]
   h. To Obtain an Associate Degree [30.7]
   i. Other [3.3]

5. Intent to Re-enroll (INTRETRN)

   a. Yes [79.3]
   b. No [8.7]
   c. Uncertain [12.0]

6. Self-Reported Grade-Point Average (GPA)

   a. 3.50 to 4.00 [22.0]
   b. 3.00 to 3.49 [22.6]
   c. 2.50 to 2.99 [19.0]
   d. 2.00 to 2.49 [13.2]
   e. 1.50 to 1.99 [2.2]
   f. 1.00 to 1.49 [0.3]
   g. 0.00 to 0.99 [0.0]
   h. Unestablished [20.6]

7. Frequency of Informal Interaction with Faculty Outside of Class (FACINACT)

   a. Not at All or Rarely [67.3]
   b. Occasionally [27.7]
   c. Often [3.9]
   d. Very Frequently [1.1]

8. Number of Hours Spent Studying Each Week (STDYHRS)

   a. None or Rarely [2.5]
   b. 1 to 9 Hours [45.9]
   c. 10 to 19 Hours [34.5]
   d. 20 to 29 Hours [13.2]
   e. 30 to 39 Hours [2.2]
   f. Over 40 Hours [1.7]

9. Satisfaction with the College in General (GENSAT)

   a. Very Satisfied [19.9]
   b. Satisfied [62.3]
   c. Neutral [16.1]
   d. Dissatisfied [1.4]
   e. Very Dissatisfied [0.3]

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a. Part-time students were enrolled for less than 12 semester hours

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the influence of intervening variables on a given variable. This fact serves to constrain log-linear findings because a variety of factors not considered within a given model may influence the relationships depicted within that model. Thus, in the language of path analysis, associational log-linear modeling deals only in the realm of "unmediated" effects.[1]

In general, the log of the observed frequency in the ith row and the jth column in a two variable model is given by

$$\ln F_{ij} = \mu + \lambda_i + \lambda_j + \lambda_{ij}$$

In this model, Lambda i and Lambda j are referred to as main effects and the Lambda ij is defined as an interaction effect, or a second-order effect. The Lambda parameters and μ are estimated from the data where μ is simply the average of the logs of the frequencies in all table cells.

For a three variable model the log of an observed frequency may be expressed as

$$\ln F_{ijk} = \mu + \lambda_i + \lambda_j + \lambda_k + \lambda_{ij} + \lambda_{ik} + \lambda_{jk} + \lambda_{ijk}$$

This model contains 3 main effects, 3 second-order interaction effects, and 1 third-order interaction effect.

Log-linear models may be either saturated, containing all possible effects, including main effects and interactions of main effects, as shown above, or restricted, including only combinations of interactions or main effects. A saturated model makes use of all tabulated data and, thus, reproduces the observed data perfectly.

A model without interaction effects is a derivative of a saturated model and may be thought of as "nested" within the hierarchy implied by

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1. For a more complete discussion of the efficacy of structural equation modeling, in particular LISREL techniques, as applied to persistence research, see Voorhees (1985), page 88-89.

a saturated model. The strategy generally employed in hierarchical modeling is to fit a model with interaction terms and then a model consisting of only main effects. The change in chi-square values between the fit of these two models to the data is attributable to interaction effects. Lower order terms are left in the model if a higher order interaction is significant, even if the lower-order terms are not. The maximum-likelihood chi-square is the goodness-of-fit statistic of choice in hierarchical modeling because, unlike the Pearsonian chi-square, it possesses component properties which make it easier to estimate hierarchical models. The decrease in value of the maximum-likelihood chi-square when terms are added to a model indicates the contribution of those terms to the fit of the model to the data. The smaller the chi-square statistic for a given model within a hierarchy of models, the more closely that model appears to fit the data. As in any use of the chi-square statistic to determine goodness-of-fit associations, the researcher must bear in mind that a large sample size tends to inflate chi-square values and, thus, artificially increases the chance for detecting statistical significance.

Because observed data is captured completely by a saturated model, the value of the chi-square statistic for a saturated model is always zero. However, all possible interactions estimated by a saturated model are difficult to interpret and describe. Opportunities to offer parsimonious description of interaction effects in saturated models of more than 2 dimensions, that is, 2 by 2 by 2 tables or higher, decrease in proportion to the number of variables posited.

Results

The Statistical Package for the Social Sciences (SPSS-X, Norusis,

1985) was used to estimate 4 hierarchical log-linear models posited by this study. In particular, a technique known as backward elimination (Norusis, 1985, p. 312) was used to reduce the number of effects in model under investigation. Backward elimination has as its starting point a hierarchical model posed by the researcher. As a first step, the term whose removal results in the least-significant change in the likelihood-ratio chi-square is eligible for elimination provided that the observed significance level corresponding to that term is larger than the criterion established for remaining in the model. In this investigation, the criteria used for remaining within the model was .05. Although backward elimination serves as a guide in determining which competing model might be selected to fit the observed data, it is not a substitute for substantive judgement. Model fitting is at once a science and an art form. Statistics alone cannot point to a single model that is conceptually defensible; knowledge of the concepts under study should work in tandem with statistical probability to produce a satisfactory model. The issues inherent in estimating hierarchical models are illustrated in the data presented in Tables 2 through 5.

In Table 2, the backward elimination technique produced a final model of the association between persistence, sex, and full-time vs. part-time registration status with an associated L2 of 5.94 with 3 degrees of freedom. The relatively low L2 for the final model is sufficient to allow the relationship described by the final model to be termed plausible and suggests the presence of a significant interaction between persistence and sex. Post-hoc inspection of observed and expected counts implied by the final model indicate that male students, both part-time and full-time, did not persist to the same extent as did females and that full-time students persisted to a greater degree than

Table 2

Hierarchical Log-Linear Model of the Association among Persistence, Sex, and Full-Time vs. Part-Time Status

Fitted Marginals	Residual			Component		
	Likelihood Ratio	df	p	Likelihood Ratio	df	p
FTPT * SEX	5.94	3	.114	2.77	1	.096
PERSIST * FTPT	3.17	2	.205	2.12	1	.146
PERSIST * SEX * FTPT	0.00	0		1.05	1	.306

Final Model:

PERSIST * SEX
FTPT

Table 3

Hierarchical Log-Linear Model of the Association among Persistence, Ethnicity, and Purpose for Enrolling

Fitted Marginals	Residual			Component		
	Likelihood Ratio	df	p	Likelihood Ratio	df	p
PERSIST * PURPOSE	80.01	76	.991	15.01	76	.059
PERSIST * ETHN	35.06	68	1.000	6.74	28	1.000
ETHN * PURPOSE	28.32	40	.917	24.39	36	.929
PERSIST * ETHN * PURPOSE	0.00	0		3.93	4	.415

Final Model:

PERSIST
ETHN
PURPOSE

Table 4

Hierarchical Log-Linear Model of the Association among Persistence, Satisfaction with the College in General, and Intent to Re-Enroll

Fitted Marginals	Residual			Component		
	Likelihood Ratio	df	p	Likelihood Ratio	df	p
PERSIST * GENSAT	15.44	20	.751	4.43	6	.619
GENSAT * INTRETRN	11.01	14	.686	7.06	2	.531
PERSIST * GENSAT * INTRETRN	0.00	0		3.95	6	.683

Final Model:

PERSIST * INTRETRN
GENSAT

Table 5

Hierarchical Log-Linear Model of the Association among Persistence, Grade-Point Average, Number of Informal Interactions with Faculty, and Number of Hours Spent Studying Each Week

Fitted Marginals	Residual			Component		
	Likelihood Ratio	df	p	Likelihood Ratio	df	p
PERSIST * FACINACT	140.41	272	1.000	4.14	3	.247
PERSIST * STDYHRS	136.27	269	1.000	5.07	6	.535
PERSIST * GPA	131.21	263	1.000	4.89	27	1.000
GPA * STDYHRS	126.32	236	1.000	38.77	95	1.000
PERSIST * GPA * STDYHRS	87.54	141	1.000	15.17	27	.957
GPA * FACINACT	72.37	114	.999	8.25	23	.997
FACTINACT * STDYHRS	64.19	91	.985	15.63	37	.999
PERSIST * FACINACT * STDYHRS	48.49	54	.686	7.14	17	.982
GPA * FACINACT * STDYHRS	41.36	37	.286	18.08	23	.753
PERSIST * GPA * FACTINACT	23.28	14	.056	13.10	0	1.000
PERSIST * GPA * FACTINACT * STDYHRS	0.00	0		10.17	14	.750

Final Model:

PERSIST
GPA
FACTINACT
STDYHRS

normal values for the final model revealed no significant departures from normality.[2]

The large jump in component L2 from the saturated model to the first test of the second-order interaction in Table 3 (28.32) indicates that the progression of model selection inherent in the backward elimination technique can produce models whose credibility might be challenged on substantive grounds. The final model in Table 3 has an associated L2 of 50.01 and suggests that all second-order interactions among the main effects do not contribute to a good fit to the data. Thus, according to the backward elimination algorithm, persistence, ethnicity, and purpose for enrolling are independent factors. The large increase in component L2 arising from excluding the third-order term, however, suggests that all second-order terms might be retained. Post-hoc testing for independent effects produced a model with an associated L2 of 30.00 with 76 degrees of freedom and a probability of 1.000. Post-hoc testing for second-order interaction effects produced a model with an associated L2 of 103.13 with 45 degrees of freedom and a probability of .000. The large difference between the independence model and the model with second-order effects, 73.13 (103.13 - 30.00) and the low probability associated with the second-order model provides strong evidence that the model with second-order effects should be rejected in favor of the independence model suggested by the backward selection technique.
The largest residual values, implying discrepancies between the observed and implied contingency tables, were for white students, who proportionately outnumbered minority students in their desire to transfer to four-year colleges and universities. Conversely, minority students were

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2. Further statistical analyses of the data reported in this study are available upon request of the author.

more likely to attend the college for job-related classes or to earn Associate degrees.

The data in Table 4 also show a large increase in component L2 (7.06) when the first second-order effect was eliminated from the model. This component increase is, however, much less than the corresponding increase for elimination of the first second-order term in Table 3 and the final L2 produced by backward selection was 15.44, a goodness-of-fit statistic that appears reasonable. Post-hoc comparisons of expected normal values plotted against adjusted residuals indicates no significant departures from normality within the final model. In this instance, the final model is also supported by previous findings (Bean, 1983) tracing the impact of student intentions to return on persistence. General satisfaction with the college was found to be independent of the other variables in the final model and may be indicative of an orientation of community college students in which satisfaction with the college in general is not an obstacle, nor a boost, to student persistence.

Because of the number of variables involved, the data found in Table 5 are the most difficult to interpret of the models posited. The final model suggests that persistence, grade-point average, number of informal interactions with faculty outside of class, and number of hours spent studying each week are independent effects. The L2 associated with the final version of this model is 140.41, and several component effects, including the first third-order term eliminated from the model, are associated with perfect probabilities (1.000). Given the uneveness in component changes displayed throughout the table, the relatively small jump in L2 associated with elimination of the first third-order term (13.10) might suggest that it might be retained. As a guide, Kennedy

(1983) reports that models that fall between the first significant residual chi-square and the first significant component chi-square are likely candidates for selection. Because third-order effects fall beyond these bounds, their elimination appears warranted. Similarly, inspection of observed and implied residuals for second-order effects suggests potential associations between informal faculty interaction outside of class and between persistence and between GPA and persistence. The first of these second-order terms, however, is beyond the level of the first significant residual chi-square and results in exclusion of all second-order effects from the final model.

Discussion

This study has investigated the importance of demographic variables shown to be significantly associated with the persistence of community college students and conceptual variables, such as the number of informal interactions with faculty and intentions to return, which are not commonly found in the available studies of persistence patterns among community college students.

Significant findings include the interaction of persistence and sex; independent effects for persistence, ethnicity, and purpose for enrolling; the interaction of persistence and intention to return; and independent effects for persistence, grade-point average, the number of informal interactions with faculty, and the number of hours spent studying each week. To researchers familiar with both community colleges and the literature of persistence, these findings should not be surprising.

Community colleges, with their ease of access, central locations within the communities they serve and commitment to providing a wide diversity of educational experiences, are unique institutions serving a

clientle that is much more heterogeneous with respect to both demographic characteristics and reasons for attending than students enrolled in other sectors of higher education. The ease with which students enter a community college and the relatively low cost they bear may translate into less commitment toward a particular institution which, in turn, means that fewer students can be expected to persist.

Community colleges reflect in an immediate sense, perhaps to a degree greater than other sectors of higher education, the trends within their immediate environments. For example, when the local economy rises, enrollments fall because many students can find employment which may be more attractive than remaining in school. Additionally, the majority of students attending the nation's community colleges attend on a part-time basis. It is these part-time students that provide the lifeblood of the community college and, at the same time, differentiate the fabric of the community college from its four-year college and university counterparts. This study supports previous research which shows that part-time students are significantly less likely to persist. In particular, the findings presented here indicate that full-time female students had greater persistence than their male counterparts.

Ethnic status did not appear to interact with either the purpose for which a student entered the college or with the observed rates of persistence among the subjects. This suggests, within the context particular college that this research was conducted, that there is little relationship among ethnic status, reasons students enroll, and their persistence patterns. However, since interaction among variables is one topic and independence is another, the intervening effects of other measures on ethnic status and purpose for enrolling should not be

overlooked in future research tracing the persistence patterns of community college students.

The concept of student general satisfaction with the institution is an important topic among community college administrators. The results of this study confirm its importance in persistence decisions. However, these results do not illuminate any of the possible other variables with which general satisfaction with the college is likely to interact. Intention to return interacted significantly with community college persistence, a finding that parallels previous path analytic findings conducted within a university environment (Bean, 1983).

Academic integration in this study was represented by a four way model consisting of persistence, grade-point average, number of informal interactions with faculty, and number of hours spent studying each week. The final model included these variables as independent effects, suggesting that no interactions were present with respect to these variables among the sample. This model was potentially the most difficult to interpret of the persistence models presented, although its interpretation was facilitated by exclusion of interaction effects. Substantively, community college students, because of their other commitments, may have less time to interact informally with their instructors and less time to study each week. On the other hand, given sufficient time and motivation to pursue these ends, it appears that none of these factors interact with each other. Academic integration may be of less importance in explaining the persistence of community college students than corresponding measures are in explaining the persistence of four-year college or university students.

The subjects of this investigation were selected in such a way as to preserve the heterogeneous composition typical of community

college students. This may explain, in part, the findings reported here. For instance, it is entirely possible that general satisfaction with the institution and persistence might significantly interact among full-time students or that purpose for enrolling might interact with ethnic status in a sample consisting solely of minority students. Future studies of community college persistence may consider, for example, only carefully defined subpopulations such as females, students expressing transfer intentions, or students receiving financial aid.

This study has attempted to illustrate the application of log-linear modeling to persistence research. Because the level of measurement entertained in most persistence studies is categorical in nature, the use of log-linear techniques frees the researcher from the untenable assumptions associated with techniques that require interval or ratio level data for execution. However, as is the case with any statistical technique, log-linear modeling is a tool than can be misapplied. Correctly employed, log-linear techniques can illuminate fundamental relationships among selected measures and can provide a base to guide additional inquiry.

REFERENCES

Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a casual model of student attrition. Research in Higher Education, 12, 155-187.

Bean, J. P. (1983). The application of a model of turnover in work organizations to the student attrition process. Review of Higher Education, 6, 129-148.

Bean, J. P., & Metzner, B. S. (1985, March). A conceptual model of nontraditional student attrition. Paper presented at the Annual Meeting of the Association for the Study of Higher Education, Chicago.

Endo J. J. & Harpel, R. L. (1982). The effect of student-faculty interaction of Students' educational outcomes. Research in Higher Education, 16, 115-138.

Haller, A. O., & Portes, A. (1973). Status attainment process. Sociology of Education, 46, 51-91.

Hinkle, D. E., & McLaughlin, G. W. (1984). Selection of models in contingency tables: A reexamination. Research in Higher Education, 21, 415-423.

Kennedy, J. J. (1983). Analyzing Qualitative Data: Introductory Log-Linear Analysis for Behavioral Research. New York: Praeger.

Knoell, D. M. (1976). Through the open door: A study of patterns of enrollment and performance in California's community colleges. Sacramento: California State Postsecondary Education Commission. (ERIC Document Reproduction Service No. ED 119 752)

Lenning, O. T., Beal, P. E., & Sauer, K. (1980). Retention and attrition: Evidence for action and research. Boulder, CO: National Center for Higher Education Management Systems.

Lenning, O. T., & Hanson, G. R. (1977). Adult students at two-year colleges: A longitudinal study. Community/Junior College Research Quarterly, 1, 271-294.

Mahoney, J. R. (1986, March 25). Percent first-time freshmen credit enrollment, Fall 1984. AACJC Letter.

National Center for Education Statistics. (1980). The condition of education for hispanic americans. Washington, DC: U.S. Government Printing Office.

Norusis, M. A. (1985). SPSS-X advanced statistics guide. Chicago: McGraw-Hill.

Pascarella, E. T., Duby, P. B., & Iverson, B. K. (1983). A test and reconceptualization of a theoretical model of college withdrawal in a commuter institution setting. Sociology of Education, 56, 88-100.

Pascarella, E. T., & Terenzini, P. T. (1977). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. Journal of Higher Education, 48, 540-552.

Peng, S. S., & Fetters, W. B. (1978). Variables involved in withdrawal during the first two years of college: Preliminary findings from the National Longitudinal Study of the High School Class of 1972. American Educational Research Journal, 15, 361-372.

Rootman, I. (1972). Voluntary withdrawal from a total adult socializing organization: A model. Sociology of Education, 45, 258-270.

Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. Interchange, 1, 64-85.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 89-125.

Voorhees, R. A. (1985). Student finances and campus-based financial aid: A structural model analysis of the persistence of high need freshman. Research in Higher Education, 22, 65-92.

Winter, G. M., & Fadale, L. M. (1986). Noncompleters/Successful Leavers. Community/Junior College Quarterly, 10, 101-111.

Walleri, R. D. (1981). Student retention and attrition in the community college: A review and research design. Gresham, OR: Mount Hood Community College. (ERIC Document Reproduction Service No. ED 210 064)